IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re- application of LAFONT et al

Serial No. 10/508,739

Group art Unit: 3773
Examiner: GREGORY A ANDERSON

Filed 04/02/2004

For: "Polymer based-stent assembly."

DECLARATION UNDER RULE 132

Hon. Commissioner of Patents and Trademarks
WASHINGTON D.C. 20231

Sir:

I, Tahmer Sharkawi, residing at 1, bis St-Hubery, 34430 St-jean de Védas, France.

Declare and Say:

I am a citizen of Germany residing in France.

I am Doctor in Science (PhD in Material Chemistry) and I am a Project manager working as employee of the company Arterial Remodeling Technologies in a laboratory of the CENTRE NATIONAL DE RECHERCHE SCIENTIFIQUE (CNRS).

I am an inventor of the present patent application (Serial No. 10/508,739).

I read the **Killion** patent (US 6,022,371). This document does not describe an assembly according to our invention or a method to prepare such an assembly.

Killion describes a **stent which has a locking mechanism**, in particular locking arms which move into connection with grooves or teeth in the stent.
This patent however **does not describe a single example of a stent made of a polymer**.

Killion further **nowhere refers to the glass transition temperature (Tg)**. This is because the teaching of Killion is directed to a locking stent made of a metal or a metal alloy (Nitinol^{TM}) and not of a polymer.
Killion also **does not teach a quenching step** according to the present invention. The cooling step described in Killion (lines 45-46, column 3) is intended to control the mineral crystalline morphology of metal or metal alloys. Killion does not suggest quenching a polymer.

The method provided by Killion (see colum 3, lines 31-49) may actually only be applied to a tube made of a metal or a metal alloy, such as Nitinol™. In particular, **such a method cannot be applied to a tube made of a bioresorbable polymer**.
A tube made of a polymer and submitted to the particular conditions described in Killion ("heat set at about 510°C. for about 2 minutes") would not lead to an educated stent.
Such a temperature will indeed **destroy** a tube made of such a polymer: it will burn the polymer.

The physico-chemical mechanism of conforming or orienting organic polymer chains at low temperatures (such as described in US 10/508,739) cannot be assimilated to a mechanism of which the aim is to change from one mineral (metallic) crystalline microstructure morphology to another.
Bioresorbable polymers, in particular polymers of the patent application (Paragraph 24) **cannot resist the high temperature (510°C.) of Killion due to thermal degradation**, as demonstrated by the art (see enclosed references 1 to 4):
a. PLA : Decomposition : T° = 508-528°K= 235-255 °C (Reference 1, « Polymer data handbook », 1999, page 629)
b. PGA : Decomposition : T° = 527°K= 254°C (Reference 1, page 568)
c. PLAGA (PLGA) : Decomposition T°= 330°C (Reference 2, « Barbanti et al. », table 4, page 78 and second and third paragraphs, left column, page 79)
d. PLAGLGA: Decomposition T°= 235-255 °C (Reference 1, pages 568 and 629)
e. Polyglyconate : Decomposition T° = 250-290°C (Reference 3, third, fourth and sixth paragraphs, right column, page 3540, and Figure 5b), page 3544)
f. PCL: Decomposition T°=300-400°C (Reference 4, "Thermogravimetric Analysis" paragraph and Figure 1, page 289, and first paragraph and Figure 2, page 290).

Further, when considering only the duration of the heating step of Killion, "*about 2 minutes*" is **not enough of a duration** to achieve the complete relaxation of polymer chains necessary to actually erase memory of previous processing of a polymeric tube.

The following experiences have been performed in our laboratory:

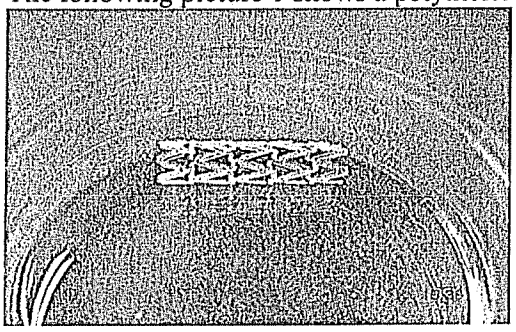
I Evaluation of a Heat setting treatment as described in Killion 6,022,371 (Col. 3 ll. 39-45) on a polymeric stent.

The experiment has been performed at the CENTRE NATIONAL DE RECHERCHE SCIENTIFIQUE laboratory IBMM UMR 5247.

Equipment used:
- Sybron Thermodyne type 48000 Furnace
- Laboratory timer
- ART polymeric stent OF10073/15b

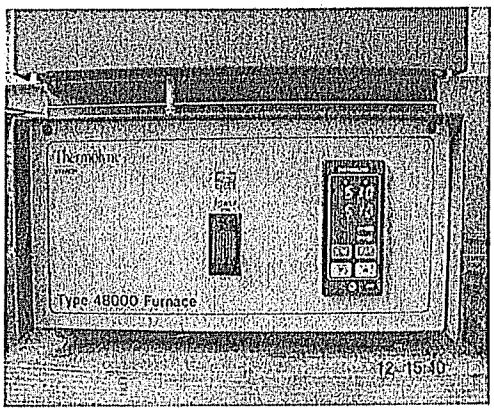
Protocol:
1) Set furnace to 510 °C and wait until set temperature is reached
2) Place polymer stent in furnace for 2 minutes
3) Retract polymer stent from furnace
4) Observe effect of heat setting on physical aspect of stent

The following picture 1 shows a polymeric stent before expositions to Killian's conditions :



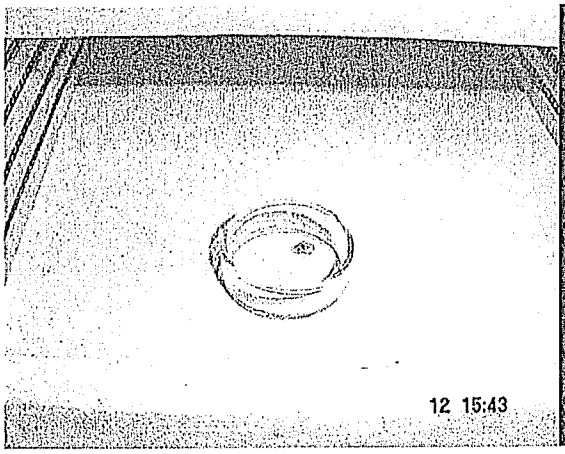
Picture 1

Exposition of the polymeric stent to the Killian's conditions: 2 minutes at 510°C.:

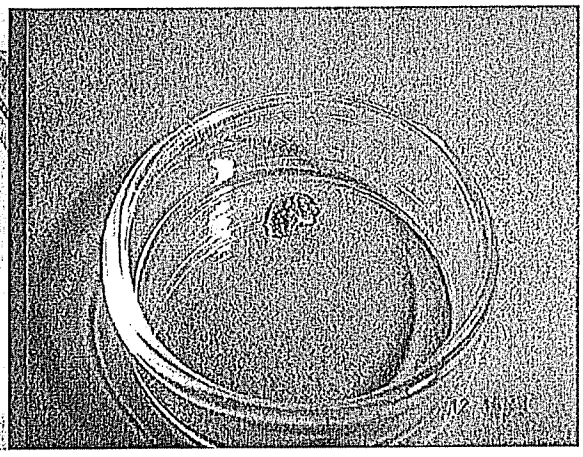


Picture 2

The following Pictures 3 and 4 show a polymeric stent after expositions to Killian's conditions:



Picture 3



Picture 4

Conclusion:

The method described in Killion 6,022,371 applied to the stent described in US patent application 10/508,739 leads to the complete destruction of the polymeric stent.

The conditions set forth in Killion ("heat set at about 510°C. for about 2 minutes") are not applicable to a bioresorbable polymeric stent.

II Verifying the impact of the heat setting treatment as described in Killion 6,022,371 (Col. 3 ll. 39-45), applied for 2 minutes, on the relaxation of polymer chains necessary to actually erase memory of previous processing thereof.

The experiment has been performed at the CENTRE NATIONAL DE RECHERCHE SCIENTIFIQUE laboratory IBMM UMR 5247.

Equipment used:
- 1 preheated oven at 80°C
- Perkin Elmer Differential Scanning Calorimeter (DSC) 6
- Polymer tubing ART C002 extr 0704503E

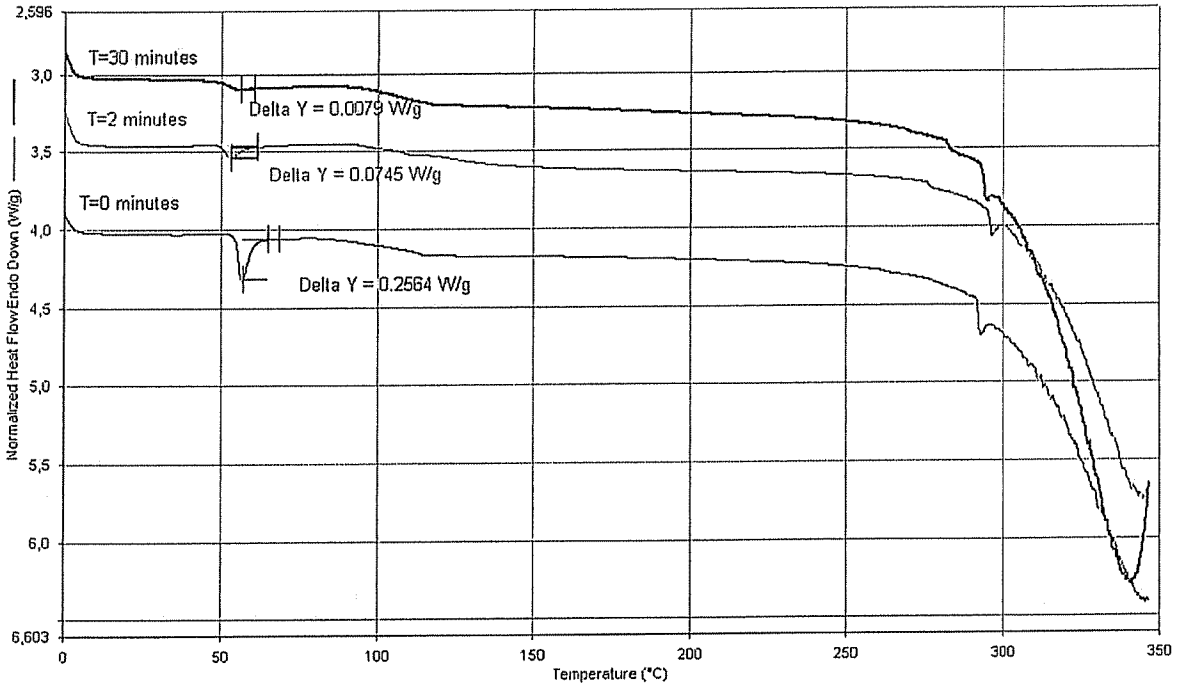
Protocol:
1) Incubate three polymer samples at
a. 0 minutes
b. 2 minutes (Killion method)
c. 30 minutes (example provided in US 10/508,739)
Analyze the polymer sample by DSC to verify residual processing related orientation and relaxation using the following program
Temperature Program:
1) Hold for 5.0 min at 0.00°C
2) Heat from 0.00°C to 350.00°C at 10.00°C/min

Report:
- Method Filename: C:\Program Files\Pyris\Data\Tahmer\cooking\test121108\T0.d6d
Sample ID: ART C002 extr 0704503E
Operator ID: Tahmer
Comment: Tube sans recuit
Sample Weight: 7.200 mg
Data Collected: 12/11/2008 14:08:51

- Method Filename: C:\Program Files\Pyris\Data\Tahmer\cooking\test121108\T02.d6d
Sample ID: ART C002 extr 0704503E
Operator ID: Tahmer
Comment: Tube recuit 2 min
Sample Weight: 6.400 mg
Data Collected: 13/11/2008 11:19:22

- Method Filename: C:\Program Files\Pyris\Data\Tahmer\cooking\test121108\T30.d6d
Sample ID: ART C002 extr 0704503E
Operator ID: Tahmer
Comment: Tube recuit 30 min
Sample Weight: 7.200 mg
Data Collected: 12/11/2008 15:03:07

Thermograms of PLA samples heated at three different times: Blue 0 minutes, Green 2 minutes (Killion method) and Red 30 minutes (patent application US 10/508,739).



The above picture shows differential scanning calorimeter (DSC) thermograms of PLA samples heated at three different times: Blue 0 minutes, Green 2 minutes (Killion method) and Red 30 minutes (US 10/508,739). The Blue and Green thermograms show an endothermic peak known as the polymer chain relaxation peak at Tg (55-60°C) which can be quantified at 0,2564 and 0,0745 Watts/Gram respectively. Whereas the red thermogram shows a simple change in baseline with no endothermic peak (0.0079 watts/gram).

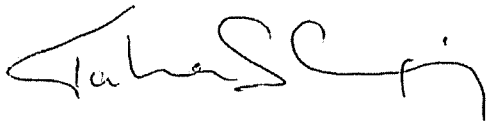
Conclusion:
The polymeric chains in the blue and green samples are not fully reoriented and relaxed, contrary to what is observed regarding the polylmeric chains in the red sample. In other words 0 and 2 minutes are not appropriate durations to reach the aim of erasing memory of previous processing of the polymer.

The duration of 2 minutes described in Killion (Col.3 ll 44-45) does not allow the complete relaxation of polymeric chains which is necessary to actually erase the memory of previous processing of said polymeric chains .

As a conclusion, the **Killion patent neither describe nor suggest a method as claimed in patent application US 10/508,739.**

The undersigned Declarant declares further that all statements made herein of this own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed this day of December 2, 2008



TAHMER SHARKAWI